APPENDIX B

April 18, 1997 - Weavertown Environmental *Work Plan to Complete Remediation of Biocells*

Science Applications International Corporation

WEG

Weavertown Environmental Group

a Division of Weavertown Transport Leasing, Inc.

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April 18, 1997

Mr. Ahmad S. Talebi
Engineer
State of West Virginia
Division of Environmental Protection
Office of Waste Management
Compliance Monitoring and Enforcement
1356 Hansford Street
Charleston, WV 25301-1401

RE: Work Plan to Complete Remediation of Biocells at Chemical Leaman Tank Lines, Inc. Terminal in Institute, WV EPA ID No.: WVR 000 001 719

Dear Ahmad:

This is to transmit the Work Plan to complete remediation of the biocells at the Chemical Leaman Tank Lines, Inc. (CLTL) terminal in Institute, West Virginia. Based on the results documented in the Biocell Sampling and Analysis Report, the bulk of the soils in the biocells currently meet LDRs, however, additional bioremediation is required for soils in seven of the eight biocells. As a result, in accordance with the Consent Decree, we are again requesting an Emergency Permit to complete the bioremediation work. A check for $500 is enclosed to cover the fee for the Emergency Permit. The additional bioremediation work will be completed in accordance with the attached Work Plan.

To initiate the additional remediation work, it is our intention to remove the soils that already meet LDRs from the biocells and temporarily stockpile them onsite. The soils that require additional bioremediation will then be consolidated into the existing biocells 7 and 8 for further treatment. These soils and the existing soils in biocells 7 and 8 requiring additional treatment will be bulked with wood chips during the setup of biocells 7 and 8 to maximize the potential for air circulation during treatment. Additional air distribution piping will be placed in these biocells and the existing air supply system will be put back in working order to supply oxygen to the soils. Microbes and nutrients will be added to the soils to be treated as they are placed in biocells 7 and 8. These measures will provide for maximum treatment efficiency.

The stockpiled soils will be spread out onsite as a base for a truck parking lot after the soil consolidation is completed and biocells 1 through 6 are closed out. Based on the low volume of soils that remain to be bioremediated, it is

expected that the bioremediation process will be completed well within the 90 day Emergency Permit period.

Screening sampling of the biocells will be performed on composite samples from each biocell by performing laboratory analyses for total TPH parameters on a one week basis during the additional bioremediation activities. Once screening results indicate that the bioremediation is complete, verification sampling will be performed in accordance with the January 22, 1997 approved sampling plan.

As was explained to you in recent telephone conversations with my staff, our terminal is in desperate need of additional parking area. We have a business opportunity that hinges on our ability to provide additional parking by June 30, 1997. For this reason and to ensure that the entire summer season is available for treatment, we would like to begin the additional bioremediation as soon as possible. Therefore we need an Emergency Permit as soon as possible. Please notify us as to when we may expect to receive the Emergency Permit. If you have any questions, please call Roy Peterson or me at 610-363-4498.

Very truly yours,

ENVIROPOWER, INC.

Donald K. Emig, Ph.D., P.E.
Vice President & Chief Engineer

enclosure

cc: H. Michael Dorsey, WVDEP OWM Compliance (w/o enclosure)
Carroll Cather. WVDEP OWM Compliance (w/o enclosure)
Tom Fisher, WVDEP OWM Compliance (w/o enclosure)
Henry Haas, WVDEP OWM Compliance (w enclosure)
Rick Minsterman, Weavertown Environmental Group (w/o enclosure)

bcc: Roy Peterson
Emerson Arnold, CLTL Charleston, WV
file

WORK PLAN
EX-SITU BIOREMEDIATION
CHEMICAL LEAMAN TANK LINES TERMINAL
INSTITUTE, WEST VIRGINIA

EnviroPower, Inc.
Exton, Pennsylvania

WEG Project No. HG-4812-96

April 18, 1997

WORK PLAN
EX-SITU BIOREMEDIATION
CHEMICAL LEAMAN TANK LINES TERMINAL
INSTITUTE, WEST VIRGINIA

Prepared for:

EnviroPower, Inc.
Exton, Pennsylvania

Prepared by:

Weavertown Environmental Group
Canonsburg, Pennsylvania

April 18, 1997

WEG Project No. HG-4812-96

TABLE OF CONTENTS

WORK PLAN
EX-SITU BIOREMEDIATION
CHEMICAL LEAMAN TANK LINES TERMINAL
INSTITUTE, WEST VIRGINIA

1.0 INTRODUCTION

This Work Plan for ex-situ bioremediation has been prepared by WEG Engineering (WEG) on behalf of Chemical Leaman Tank Lines, Inc. (CLTL) to identify procedures that will be used to remediate contaminated soils at the CLTL terminal in Institute, West Virginia. The bioremediation project was initiated by Vector Enterprises, Inc. (Vector), of Grayson, Georgia. Figure 1 shows the locations of the biocells. The following table shows the dimensions of each biocell:

Biocell	Length (ft)	Width (ft)	Maximum Depth (ft)	Average Depth (ft)	Estimated Volume (ft^3)
1	66	14	4.0	3.9	3,600
2	70	17	6.8	5.6	6,700
3	70	32	6.0	5.1	11,400
4	110	25	7.7	6.0	16,500
5	75	15	3.9	3.4	3,800
6	90	25	5.0	4.4	9,900
7	65	22	5.0	4.6	6,600
8	60	16	4.2	4.0	3,800
				TOTAL:	**62,300**

The total estimated volume of soils in the biocells is 62,300 ft^3, or 2,300 yd^3. The actual volume is larger than the apparent volume because the biocells extend below grade. Assuming a density of 1.5 tons/yd^3, the total estimated weight of soils in the biocells is 3,500 tons.

Vector constructed the biocells in accordance with the *Work Plan for Remediation of Buried Drums and Contaminated Soil* (Vector, 1995). During biocell construction, approximately two feet of soil was excavated in the area of each cell. Berms constructed of unimpacted soils were placed around each cell and an impermeable liner was placed in the excavation and over the soil berms. The base of each biocell was graded at a one percent slope to facilitate drainage of excess water toward a collection sump. A drainage layer of six inches of sand and gravel was placed above the impermeable liner, and filter fabric was placed above the sand and gravel. Then, the soil was placed above the filter fabric. Lengths of 3/4-inch perforated PVC pipes were placed within each biocell at 6-foot spacings horizontally and were connected to a common header pipe of solid pipe. Two positive displacement blowers were connected to the header pipes to feed air through the soils.

Between September 12 and 22, 1995, Vector collected several grab samples of soil from Biocells 1, 2, and 3 and from staged excavated soil. Samples were analyzed by Commercial Testing & Engineering, Inc. (CT&E) for total petroleum hydrocarbons in the gasoline (VOC) and diesel (SVOC) ranges using SW-846 Method 8015. The samples were analyzed for Data Quality Objectives (DQO) Level II (screening) and Level III (engineering) purposes only, and are not presented as documentation of compliance with closure criteria. Rather, they were collected to provide Vector with a preliminary evaluation of the initial state of the soils against which to track the progress of the bioremediation project. The results of these analyses are as follows:

Location	Volatile TPH (ppm)	Semivolatile TPH (ppm)
Staged Backfill	ND	8.9
Staged Excavated Soil G-1	ND	95.0
Staged Excavated Soil G-2	68.0	1000.0
Biocell #1	2.6	340.0
Biocell #2 West	ND	140.0
Biocell #2 East	ND	36.0
Biocell #3 West	1.8	23.0
Biocell #3 East	17.0	190.0

On December 4, 1995, Vector sampled all eight biocells to determine baseline conditions by compositing vertically and analyzing two such composites per biocell (three for Biocell 4). Samples were analyzed by CT&E for total petroleum hydrocarbons using EPA Method 418.1. The results were:

Biocell	East Composite TPH (ppm)	Center Composite TPH (ppm)	West Composite TPH (ppm)
1	490	NS	110
2	160	NS	160
3	350	NS	190
4	100	100	100
5	230	NS	570
6	630	NS	350
7	260	NS	390
8	140	NS	210

NS - not sampled

Also in December 1995, Vector applied a bioremedial enzymatic nutrient solution to the biocells at a rate of approximately 300 gallons per 150 yd^3 of contaminated soils. The solution was pumped onto the biocells as the soils were being mixed. Vector operated the biocells for a short time before terminating activities in late December 1995.

In February 1997, WEG advanced 56 hand auger borings through the eight biocells to determine the actual depth of soils in the biocells and to collect samples for laboratory analysis. Figure 2 shows the locations of the borings. A total of 282 locations were

sampled. Of these, samples from the bottoms of all 56 borings and from 31 shallower locations were ultimately analyzed. In accordance with the approved *Sampling and Analysis Plan* (WEG, 1997a), all analyses were by gas chromatograph and mass spectrometry (SW-846 Methods 8260 and 8270). Every VOC and SVOC with a land disposal restriction (LDR) treatment standard in terms of total concentrations (40 CFR 268) was quantified by these methods. The results of the sampling and analysis were presented in *Biocell Sampling and Analysis Report* (WEG, 1997b).

Figures 3 through 5 show cross-sections through the eight biocells, including locations of samples that contained one or more VOCs or SVOCs in concentrations exceeding their respective LDRs. Areas represented by the samples exceeding LDRs are shaded. In general, these shaded areas are based on the midpoints between samples meeting and exceeding LDRs. Based on these sections, a total of approximately 265 yd^3 of soil require additional treatment, as shown in the following table:

Biocell	Estimated Volume Requiring Treatment (yd^3)
1	3.9
2	16.5
3	7.1
4	73.4
5	0.0
6	44.8
7	101.5
8	18.1
TOTAL	**265.3**

This Work Plan is divided into five sections. This section is the introduction. Section 2.0 presents site preparation procedures. Section 3.0 presents bioremediation procedures. Section 4.0 presents site closure procedures. Finally, Section 5.0 summarizes this Work Plan.

2.0 SITE PREPARATION

This section presents information on specific procedures that will be used to prepare the site for final treatment of the partially treated soils, including erosion controls, decontamination pad construction, soil segregation, soil bulking, and biocell consolidation.

2.1 Erosion Controls

Approximately 1000 feet of silt fence will be installed along the site property line near West Virginia Route 25. Existing berms and diversion ditches will be maintained, if necessary. Finally, water inside existing biocells will be pumped out for treatment at the on-site wastewater treatment plant.

2.2 Decontamination Pad Construction

A decontamination pad will be constructed for use in cleaning field equipment that may come into contact with partially treated soils. The pad will be constructed with three layers of 6-mil plastic and will drain to a sump. Decontamination fluids will be treated at CLTL's on-site wastewater treatment plant. Decontamination solids will be added to the partially treated soils.

2.3 Soil Segregation

Figures 3, 4, and 5 show the distribution of soils meeting all LDRs and soils containing one or more VOCs or SVOCs exceeding their respective LDRs. As shown on these figures and discussed in the *Biocell Sampling and Analysis Report*, most of the soils in the biocells meet all LDRs, and do not require additional treatment. These treated soils will be removed from the biocells and stockpiled for later use as backfill for closure of Biocells 1 through 6, as described in Section 4.0. The treated soil stockpile will be outside the footprint of the biocells, but within the general area.

At each biocell, a track loader or track excavator will be used to remove already treated soils, based on the cross-sections shown on Figure 3, 4, and 5. Surveying equipment will be used to guide the excavation so that proper segregation of treated versus partially treated soils takes place.

2.4 Soil Bulking

In each biocell, after the treated soils are removed, partially treated soils will be mixed with wood chips or mulch as a bulking agent to increase the permeability of the soils to air. A total of 100 yd^3 of wood chips will be added to the 265 yd^3 of partially treated soils, for a ratio of approximately 40 percent by volume. To begin this work, existing

PVC piping that can be recovered will be removed from the biocell. Then, wood chips will be added directly to each cell and mixed with the track excavator bucket.

2.5 Biocell Consolidation

Soil segregation and soil bulking will be performed in Biocells 7 and 8 first. Partially treated soils will be left in those cells after bulking with wood chips. As partially treated soils in other cells are mixed with the wood chips, those soils will be added to Biocells 7 and 8. Based on the measured biocell dimensions and the total volume of bulked soil of 365 yd^3, the total depth of partially treated soils in Biocells 7 and 8 will be approximately 3.5 feet. A new air piping system will be added to Biocells 7 and 8. Two layers of perforated piping will be added, at heights of 6 and 30 inches above the filter fabric. Pipes will be spaced 5 feet apart horizontally. One of the two existing positive displacement air blowers will be connected to the piping for each new biocell. Each header pipe entering a biocell will also be fitted with an in-line orifice and manometer to verify that air flow is occurring. Figure 6 shows the proposed new configurations of Biocells 7 and 8.

3.0 BIOREMEDIATION

This section presents information on specific procedures that will be used to implement the ex-situ bioremediation treatment process for the partially treated soils, including inoculation, biocell maintenance, progress sampling, and verification sampling.

3.1 Inoculation

A biosolution (a mixture of water, microbes, nutrients, and biocatalyst) will be prepared at the site for reinoculation of the partially treated soils. A total of at least 425 gallons of biosolution will be sprayed onto Biocells 7 and 8 as the partially treated soils are added. This will provide for excellent mixing of solution in the soils.

The microbes will be a consortium of Series 1 and Series 6, by Osprey Biotechnics (Osprey), of Sarasota, Florida. Series 1 is a blend of *Pseudomonas* spp. ideal for aliphatic and aromatic hydrocarbons, such as found in petroleum products and mineral spirit solvents, and will reduce the bulk of the total petroleum hydrocarbons in the soils. Series 1 will also attack the heavier compounds, such as phthalates and chlorinated hydrocarbons, but with less efficiency. Series 6, a different blend of *Pseudomonas* spp., will aggressively pursue the chlorinated and other heavy hydrocarbons. Osprey's product literature is included as Appendix A.

Nutrients will consist of Munoxate, by Osprey. Munoxate provides nitrogen, phosphorus, and potassium in a mixture free of deleterious heavy metals. A total of 80 pounds of Munoxate will be added to the biosolution. The biocatalyst will be Biosolv, a surfactant/enzyme that will increase the bioavailability of the organic compounds to the microorganisms. Microbes will be awakened from their dormant state, mixed with nutrients and biocatalyst, and applied to the biocells in accordance with manufacturers' recommendations.

3.2 Biocell Maintenance

After the initial inoculation, weekly site visits will be made to inspect and maintain the blowers, remove accumulated water from the berms and sumps for treatment at the on-site wastewater treatment plant, and spray additional water, if needed, on the biocells to keep the soils moist. The original Work Plan (Vector, 1995) indicated that nutrients and enzymes would be added weekly. Based on discussions with Osprey technical support personnel, it is believed that this is not necessary. Rather, the initial application contains enough nutrients and biocatalyst to last for the entire treatment time. Therefore, no additional nutrients or biocatalyst (enzyme) will be necessary.

3.3 Progress Sampling

Each week, samples will be collected from Biocells 7 and 8 to assess the progress of the treatment process. These samples will be analyzed for Data Quality Objectives (DQO) Level II (screening) and Level III (engineering) purposes only, and will not be used to document compliance with closure criteria. Rather, they will be collected to provide a rough indication of the bioremediation progress.

Four composite samples will be collected each week, one representing each end of each biocell. Each composite sample will be composed of four subsamples collected from a depth of two feet in four borings. The midpoint depth (2 feet) was selected because it represents the farthest distance from the perforated PVC aeration pipes. This differs from the sampling strategy used in the February 1997 sampling program, where samples were generally collected from the bottom of each soil column. In that case, the aeration system had been out of operation for over a year. Therefore, soils at this depth were expected to represent worst-case conditions. Here, all soils in Biocells 7 and 8 will have experienced roughly equal treatment histories. Therefore, the midpoint of the soil column is expected to be most representative.

Figure 6 shows the approximate locations of the progress sampling boreholes. After sample collection, these borings will be backfilled with hole plug (bentonite chips) and hydrated. Figure 6 shows the approximate locations of the progress sampling boreholes. Laboratory results will be available on a five-day turnaround schedule. Each week, the previous week's TPH screening results will be assessed to identify changes that may be needed to improve or accelerate the progress of treatment. When the results indicate that the TPH concentration is below 6 ppm, CLTL may elect to perform verification sampling.

3.4 Verification Sampling

When CLTL believes that the treatment is complete, verification sampling will be performed. With one exception, the verification sampling will be performed in accordance with the methods and procedures identified in the approved *Sampling and Analysis Plan*, including sampling locations, sample analyses, sampling equipment, equipment decontamination, QA/QC samples, sample volumes, sample containers, sample preservation, sample holding times, sample identification, sample custody, and sample transportation. Please refer to the SAP for more details on specific aspects of sampling and analysis procedures. The only exception is with the list of analytes.

The following table lists all compounds that were analyzed in the February 1997 sampling and analysis program for which one or more samples contained that compound in a concentration exceeding its LDR:

Compound	LDR (mg/kg)	Compound	LDR (mg/kg)
Acetonitrile	1.8	Benzo(*a*)pyrene	3.4
Chlorobenzene	6	Chrysene	3.4
Ethylbenzene	10	1,2-Dichlorobenzene	6
Trichloroethene	6	Fluoranthene	3.4
Xylenes (Total)	30	Fluorene	3.4
Acenaphthene	3.4	Indeno (1,2,3-*c,d*) pyrene	3.4
Anthracene	3.4	Naphthalene	5.6
Benzo(*a*)anthracene	3.4	Phenanthrene	5.6
Benzo(*b*)fluoranthene	6.8	Phenol	6.2
Benzo(*k*)fluoranthene	6.8	Pyrene	8.2
Benzo(*g,h,I*)perylene	1.8		

Only these compounds will be quantitated in the verification samples.

The treatment system will remain running until the results of the verification sampling program are known. If the results indicate that the soils in Biocells 7 and 8 meet all LDRs, the site will be closed, with WVDEP approval, according to the procedures in Section 4.0. If not, the treatment system will remain in operation, with weekly maintenance, until the LDRs are achieved. If additional rounds of verification sampling become necessary, only those sampling locations where LDRs were exceeded will be resampled.

4.0 BIOCELL CLOSURE

After treatment has begun in Biocells 7 and 8, closure of Biocells 1 through 6 will begin. Scrap PVC piping, liner, and filter fabric material will be placed in a rolloff box for disposal as construction/demolition waste.

Treated soils will be used on site as fill. The stockpiled soils from Biocells 1 through 6 will be used to backfill the biocell excavations in compacted 8-inch lifts. Then, the area will be graded and compacted to conform with existing ground surface contours. Finally, filter fabric will be placed across the entire 0.8-acre area comprising Biocells 1 through 6 and six inches of angular crushed limestone and fines ("crusher run") will be placed and compacted so that the area may be used for truck parking while treatment proceeds in Biocells 7 and 8.

When treatment is complete in Biocells 7 and 8, the treated soils will be removed and stockpiled and those biocells will be closed in the same manner as described above. All equipment, including positive displacement air blowers and mixing tank will be removed from the site.

A closure report will be prepared documenting the methods and results of the treatment program. The report will include all progress and verification sampling results.

5.0 SUMMARY

This Work Plan has been developed to document procedures that will be followed to complete soil treatment at the CLTL terminal in Institute, West Virginia. Use of these procedures will provide scientifically defensible data for documenting the appropriateness and success of the bioremediation project.

FIGURES

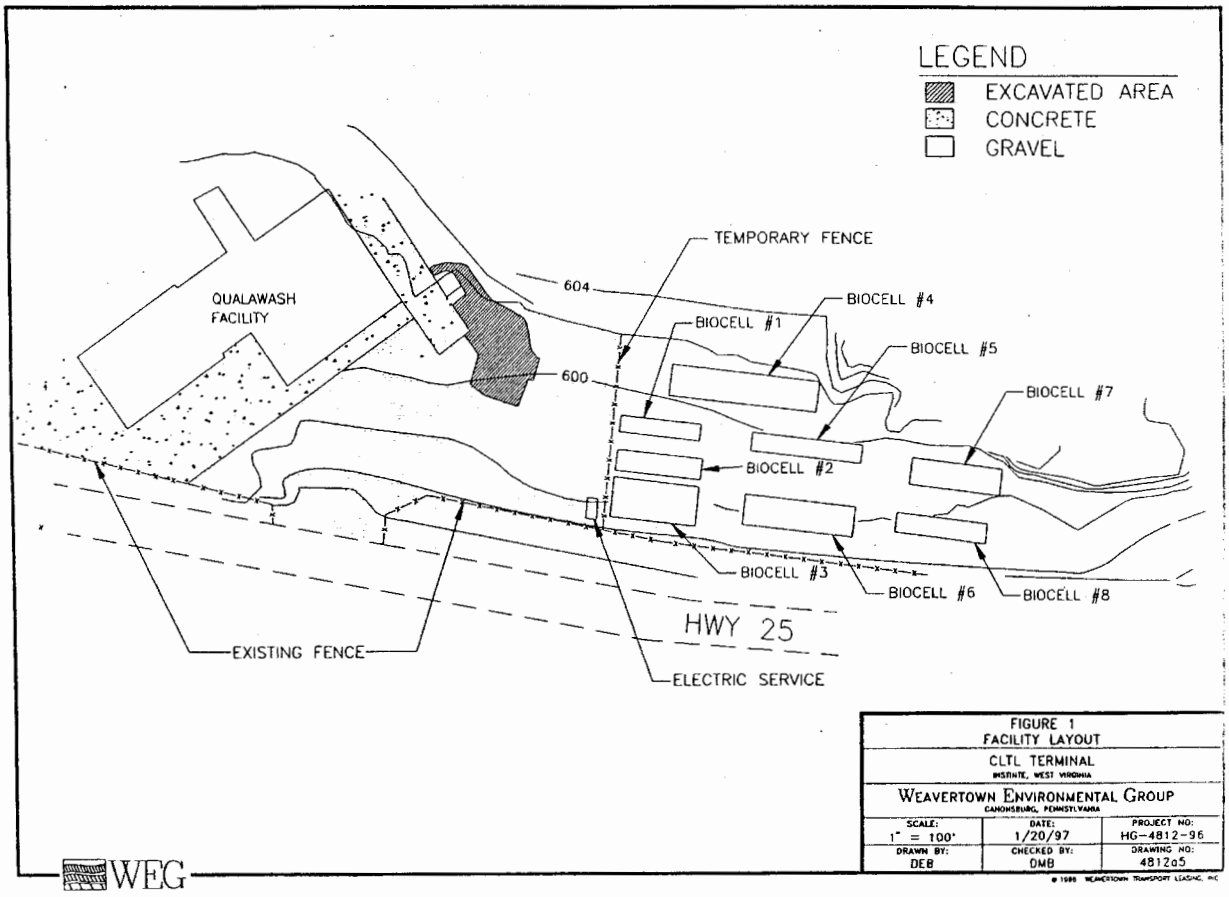
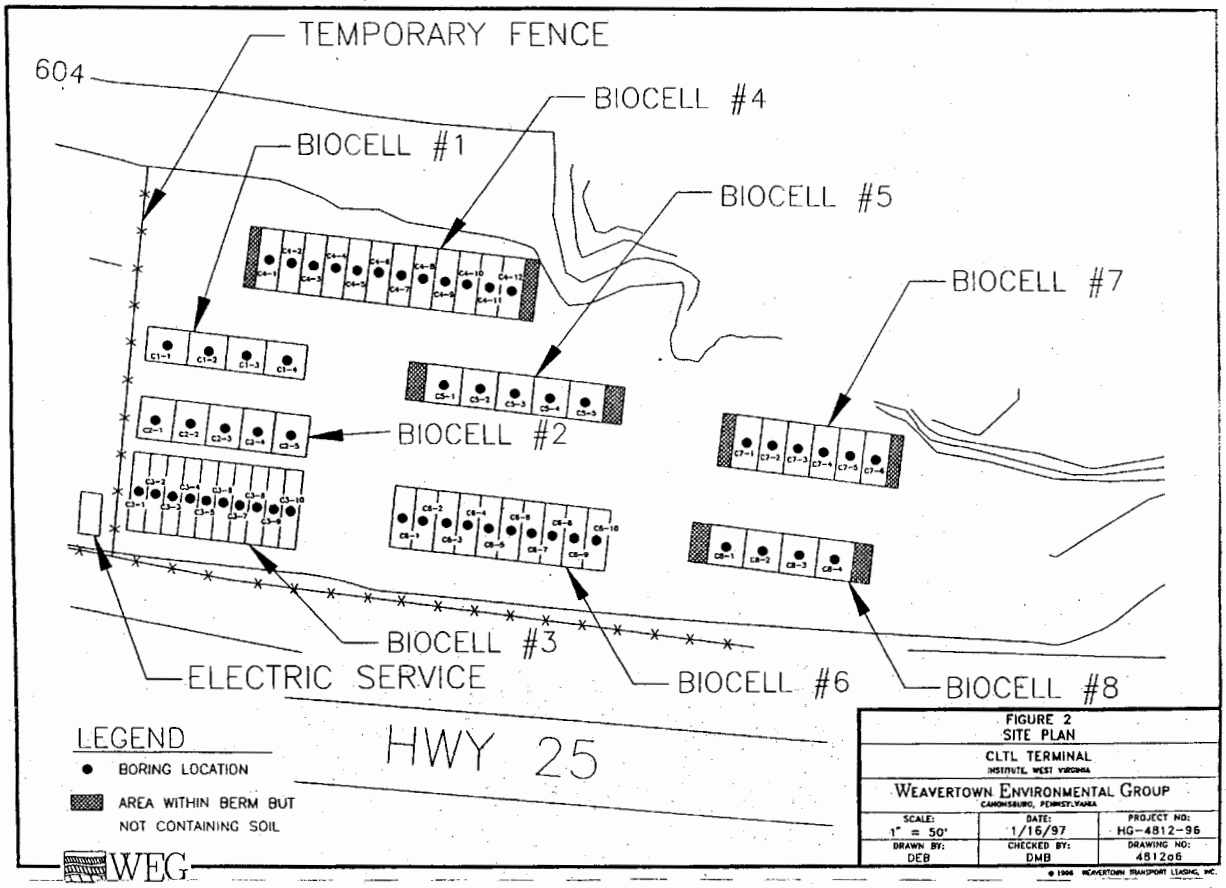
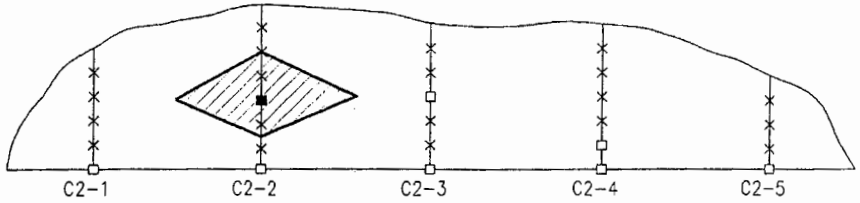


FIGURE 1 FACILITY LAYOUT		
CLTL TERMINAL INSTANTE, WEST VIRGINIA		
WEAVERTOWN ENVIRONMENTAL GROUP CANONSBURG, PENNSYLVANIA		
SCALE: 1" = 100'	DATE: 1/20/97	PROJECT NO: HG-4812-96
DRAWN BY: DEB	CHECKED BY: DMB	DRAWING NO: 4812a5

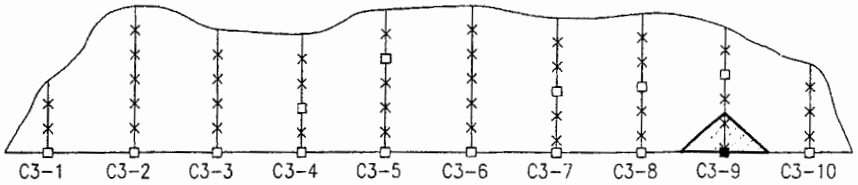
WEG


TEMPORARY FENCE
604
BIOCELL #4
BIOCELL #1
BIOCELL #5
BIOCELL #7
BIOCELL #2
BIOCELL #3
ELECTRIC SERVICE
BIOCELL #6
BIOCELL #8
HWY 25
LEGEND
BORING LOCATION
AREA WITHIN BERM BUT NOT CONTAINING SOIL
WEG
FIGURE 2
SITE PLAN
CLTL TERMINAL
INSTITUTE, WEST VIRGINIA
WEAVERTOWN ENVIRONMENTAL GROUP
CANONSBURG, PENNSYLVANIA
SCALE: 1" = 50'
DATE: 1/16/97
PROJECT NO: HG-4812-96
DRAWN BY: DEB
CHECKED BY: DMB
DRAWING NO: 481206
© 1996 WEAVERTOWN TRANSPORT LEASING, INC.

CROSS SECTION BIOCELL 1
LOOKING NORTH



CROSS SECTION BIOCELL 2
LOOKING NORTH



CROSS SECTION BIOCELL 3
LOOKING NORTH

BIOCELL 1	
BORING NO.	DEPTH
C1-1	48"
C1-2	48"
C1-3	42"
C1-4	48"

BIOCELL 2	
BORING NO.	DEPTH
C2-1	60"
C2-2	82"
C2-3	72"
C2-4	72"
C2-5	46"

BIOCELL 3	
BORING NO.	DEPTH
C3-1	36"
C3-2	72"
C3-3	60"
C3-4	58"
C3-5	70"
C3-6	72"
C3-7	66"
C3-8	68"
C3-9	62"
C3-10	44"

LEGEND

× SAMPLES NOT ANALYZED

□ SAMPLES ANALYZED AND ALL CONCENTRATIONS OF VOCs AND SVOCs ARE BELOW CORRESPONDING LDRs.

■ SAMPLES ANALYZED AND ONE OR MORE VOCs OR SVOCs ARE ABOVE CORRESPONDING LDRs.

SOILS CONTAINING ONE OR MORE VOCs OR SVOCs ABOVE LDRs.

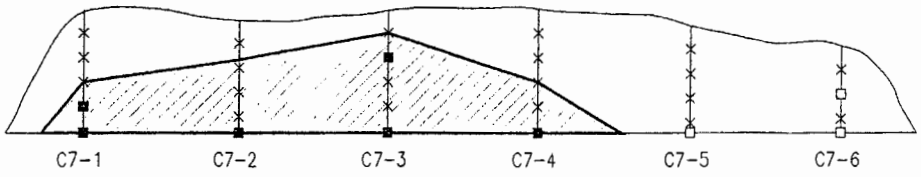
FIGURE 3
BIOCELLS 1, 2, AND 3

CLTL TERMINAL
INSTITUTE WEST VIRGINIA

WEG ENGINEERING
PITTSBURGH, PENNSYLVANIA

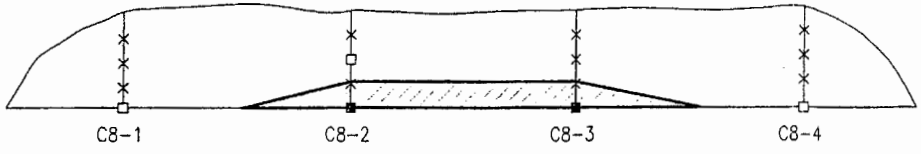
SCALE:	DATE:	PROJECT NUMBER:
H: 1"=10', V: 1"=5'	4/15/97	HG-4812-96
DRAWN BY: DEB	CHECKED BY: DMB	DRAWING NO: 4812dwg4

WEG engineering
Weavertown Environmental Group



CROSS SECTION BIOCELL 7
LOOKING NORTH

BIOCELL 7	
BORING NO.	DEPTH
C7-1	60"
C7-2	55"
C7-3	60"
C7-4	60"
C7-5	52"
C7-6	42"



CROSS SECTION BIOCELL 8
LOOKING NORTH

BIOCELL 8	
BORING NO.	DEPTH
C8-1	46"
C8-2	48"
C8-3	48"
C8-4	50"

LEGEND

- × SAMPLES NOT ANALYZED
- ⊡ SAMPLES ANALYZED AND ALL CONCENTRATIONS OF VOCs AND SVOCs ARE BELOW CORRESPONDING LDRs.
- ■ SAMPLES ANALYZED AND ONE OR MORE VOCs OR SVOCs ARE ABOVE CORRESPONDING LDRs.
- ▨ SOILS CONTAINING ONE OR MORE VOCs OR SVOCs ABOVE LDRs.

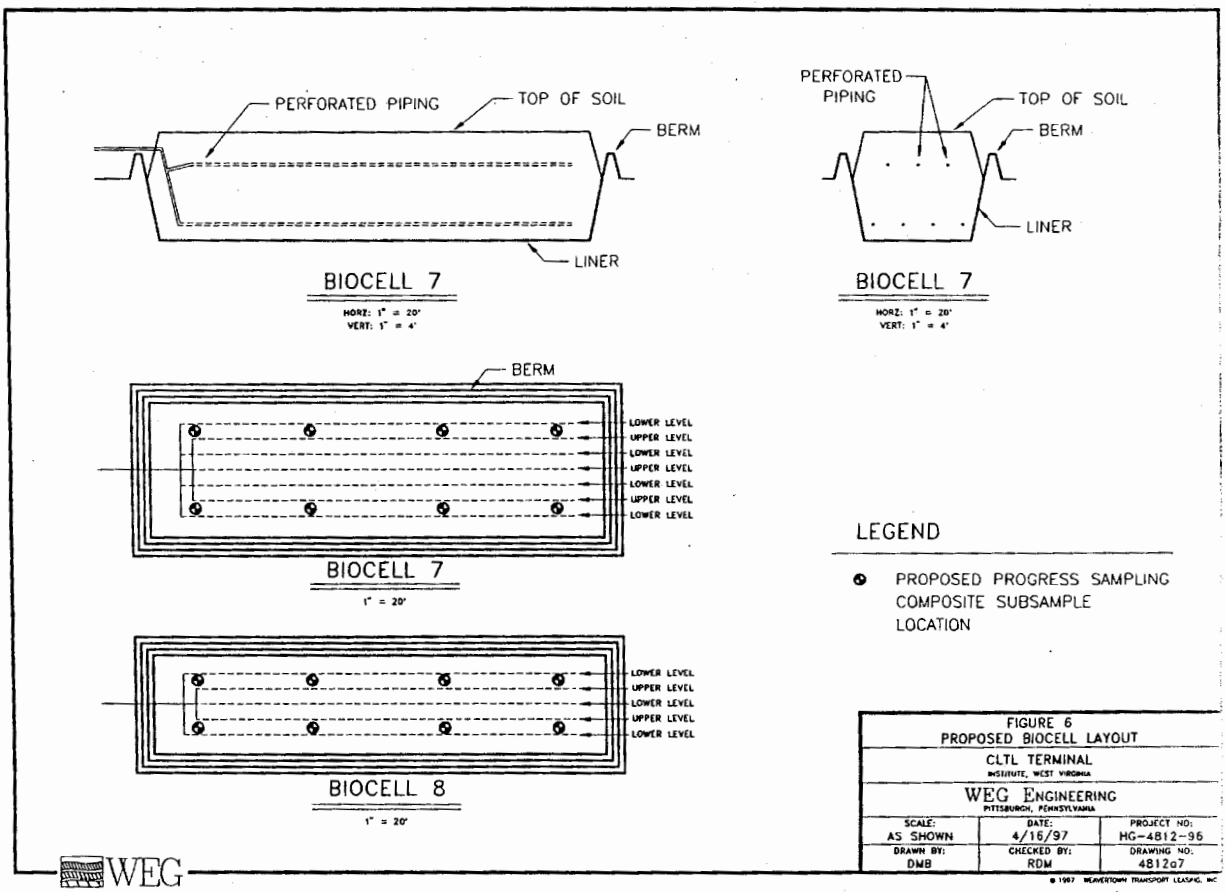
FIGURE 5
BIOCELLS 7 AND 8

CLTL TERMINAL
INSTITUTE, WEST VIRGINIA

WEG ENGINEERING
PITTSBURGH, PENNSYLVANIA

SCALE:	DATE:	PROJECT NUMBER:
H: 1"=10', V: 1"=5'	4/15/97	HG-4812-95
DRAWN BY: DEB	CHECKED BY: DMB	DRAWING NO: 4812dwg6

WEG engineering
Weavertown Environmental Group


PERFORATED PIPING
TOP OF SOIL
BERM
LINER
BIOCELL 7
HORZ: 1" = 20'
VERT: 1" = 4'
PERFORATED PIPING
TOP OF SOIL
BERM
LINER
BIOCELL 7
HORZ: 1" = 20'
VERT: 1" = 4'
BERM
LOWER LEVEL
UPPER LEVEL
LOWER LEVEL
UPPER LEVEL
LOWER LEVEL
UPPER LEVEL
LOWER LEVEL
BIOCELL 7
1" = 20'
LOWER LEVEL
UPPER LEVEL
LOWER LEVEL
UPPER LEVEL
LOWER LEVEL
BIOCELL 8
1" = 20'
LEGEND
PROPOSED PROGRESS SAMPLING COMPOSITE SUBSAMPLE LOCATION
FIGURE 6
PROPOSED BIOCELL LAYOUT
CLTL TERMINAL
INSTITUTE, WEST VIRGINIA
WEG ENGINEERING
PITTSBURGH, PENNSYLVANIA
SCALE: AS SHOWN
DATE: 4/16/97
PROJECT NO: HG-4812-96
DRAWN BY: DMB
CHECKED BY: RDM
DRAWING NO: 4812a7
WEG
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APPENDIX A

OSPREY PRODUCT LITERATURE

MUNOX®

ENVIRONMENTAL BACTERIA INOCULANT SYSTEM FOR COMMERCE & INDUSTRY

Natural Biological Digestion

Proven Safe & Effective

Ready to Use

OSPREY Biotechnics

MUNOX®

MUNOX A Safe, Sensible Way to Eliminate Stubborn Industrial & Commercial Wastes

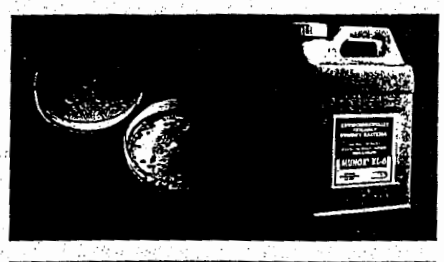
Environmental pressure on industry to provide safe solutions to the problem of elimination of various pollutants in soil and water is enormous. Concern by both the public and the private sectors demands that business and industry find a way to use our nation's natural resources and yet return them quickly to environment, free of chemical contaminants. We no longer have the luxury of allowing nature to maintain its own order and pace in environmental cleanups. Bioremediation, the application of biological treatment for cleanup of hazardous chemicals, has grown from an unknown technology to one of the major treatment technologies to enhance these cleanups. It is very cost effective compared to other treatment technologies like incineration and containment. Further, biological treatment destroys most organic wastes leaving only harmless end products thus eliminating any future environmental risks or liabilities.

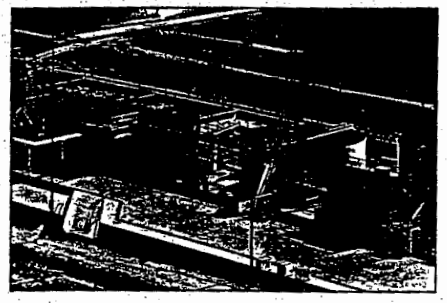
Munox is an environmental bacterial product line specifically targeted to biologically eliminate stubborn industrial and commercial wastes. It is critical for business and industry to reduce operation expenses, improve efficiency and increase profit margins. If a business is to survive, it must balance the concerns of the environment with the need to operate a profitable business. Bioaugmentation with Munox products can accomplish both; Munox can positively impact the speed and efficiency of the degradation process and do so at a reasonable cost.

MUNOX: An All Natural Product

Osprey Biotechnics manufactures and distributes Munox products which are comprised of **patented** strains of lyophilized (freeze-dried) *Pseudomonas* cultures. The bacterial strains used in Munox products are naturally occurring and are free of pathogens. Since each strain of bacteria was isolated from natural sources (contaminated soil), there is no artificial mutation or genetic engineering involved.

Available since 1982, these culture-products are well known for their performance and high quality. Munox is produced, freeze-dried and then packaged for convenient usage. Munox is available as a concentrated liquid, stable product as well as in a freeze-dried powder form.





APPLICATIONS

Industrial Wastewater Treatment

- Chemical Manufacturers
- Food Processing Plants
- Carpet and Textile Manufacturers
- Pulp and Paper Mills
- Citrus Processing
- Transportation Processing

Soil/Groundwater Bioremediation

- Crude Oil Spills
- Chlorinated Solvent and Chemical Leaks
- Fuel Oil Leaks
- Creosote Contamination

MUNOX®: High Quality, Cost-Effective Products for Non-Compromising Cleanup Results

Munox products are manufactured by Osprey Biotechnics in Sarasota, Florida. The Munox inoculant contains billions of live bacteria specifically selected by Osprey scientists to degrade a wide variety of stubborn organics. Munox products are differentiated by series numbers; Series 1 through Series 6 indicating a particular mix of bacteria intended to treat certain specific wastes.

MUNOX XL: A Stable Liquid Inoculant for Biological Wastewater Treatment

Available in 1 gallon jugs, 2.5 gallon jugs and 55 gallon plastic bottle bags, Munox XL is stable for more than six months at room temperature. It contains 1000 billion cells per gallon of product. It provides an excellent tool for continuously feeding high concentration of these versatile, hardy bacteria to improve the organic removal efficiency and withstand any shock upsets in the treatment plants.

MUNOX MULTIPLIER: High Concentration of "Hungry Bacteria" for Soil/Groundwater Cleanups

Specifically designed for seeding *ex situ* or *in situ* bioremediation projects. These products are available in 5 gallon or 55 gallon plastic bottle bags. Osprey's "Lab-in-a-Bag" technology provides the necessary laboratory conditions inside these special plastic bottle bags with unique nutrient/growth factor formulation to increase the cell concentration (from an initial 450 billion per gallon) up to 10 times. This provides environmental professionals new options along with faster cleanups (6-10 weeks average) at a very low cost.

OSPREY BIOTECHNICS: Leaders in Industrial Biotechnology

Munox is manufactured by Osprey Biotechnics under the most stringent Quality Control Protocols to ensure consistent high quality. Osprey Biotechnics is a company owned and operated by experts in the field of industrial microbiology. Key members of our management team have the technical expertise that comes with years of working at the leading edge of development and production of microbial products. Comprehensive technical and laboratory support is provided to our customers through a team of microbiologists and engineers.

MUNOX: Quality Control

Each bacterial strain used in Munox products is manufactured separately and then blended together with other strains to formulate the final product. Each Munox product lot is tested for the absence of the following pathogens:

- *Pseudomonas aeruginosa*
- *Xanthomonas sp.*
- *Salmonella/Shigella sp.*

Each product lot is also tested for growth in presence of following hydrocarbons to ensure their ability to degrade various stubborn organic contaminants:

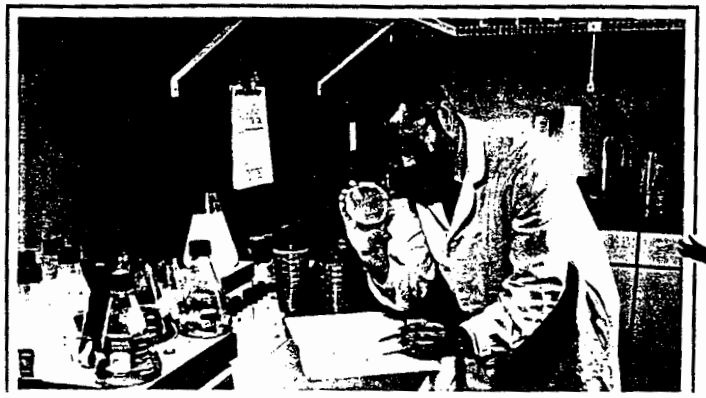
- Naphthalene (a PNA compound)
- Hexane (a n-alkane)
- Tributyrin (for degradation of fats and oils)

MUNOX: Target Compounds

- Oils & Greases (Edible Oils)
- Petroleum Hydrocarbons (BTEX, PAHs)
- Aliphatic Chlorinated Hydrocarbons (TCE, PCE)
- Aromatic Hydrocarbons (Phenol)
- Pesticides, Insecticides (PCP, 2,4-D, 2,4,5-T)
- Citrus related Oils (Limonene, Terpene based solvents)

MUNOX

- Quick Acting
- Simple to use
- Low Cost



OSPREY
Biotechnics

2530 B Trailmate Drive
Sarasota, FL 34243

OSPREY Biotechnics
2530 Trailmate Drive • Sarasota, FL 34243
Phone (941) 758-7770 • Fax (941) 758-0428

MUNOX® APPLICATIONS

FOR SPECIFIC OR SEVERE PROBLEMS CONTACT OSPREY BIOTECHNICS 1-800-553-7785

CONTAMINANT	*MUNOX SERIES RECOMMENDED*
ANTHRACENE	5
CHLOROTOLUENE (M-)	5
CHLOROTOLUENE (O-)	5
CHLOROTOLUENE (P-)	5
CHRYSENE	5
CRESOLS (MIXED)	5
DI-N-OCTYLPHTHALATE	6
DICHLOROBENZENE	1
DICHLOROETHANE (1,1-)	6
DICHLOROETHANE (1,2-)	6
DICHLOROPROPANE (1,2-)	6
DICHLOROTOLUENE (2,5-)	1
FLUORENE	5
ISOPRENOIDS	2
LIMONENE (INCLUDING CITRUS BASED CLEANING COMPOUNDS)	2
METHYL ETHYL KETONE	1
METHYLENE CHLORIDE	1
NAPHTHALENE	1
OIL/GREASE (FOOD)	1
PENTACHLOROPHENOL	5
PHENANTHRENE	5
PHENOL	5
STARCH	*
TERPENE COMPOUNDS	2
TETRACHLORETHANE (1,1,2,2-)	6
TOLUENE	1
TRICHLOROETHANE (1,1,2-)	6
TRICHLOROETHYLENE	6
CRUDE OILS/SLUDGES	1
XYLENE	1
OIL/GREASE (PETROLEUM)	1
BTEX	5

*INQUIRE

12/13/95

MUNOX
Product Information Bulletin

How MUNOX Can Benefit You

MUNOX is a natural bacterial product that can directly improve your bottom line and help you tackle your toughest organic waste treatment problems. Comprised of a blend of naturally occurring strains of bacteria with exceptionally high degradation capabilities, MUNOX has been successfully applied to improve the wastewater treatment system or in clean-up operations of hazardous and nonhazardous wastes in the following types of operations:

- Chemical and Solvent Manufacturers
- Wood Preservatives Operations
- Textile Mills and Textile Product Manufacturers
- Meat and Poultry Producers
- Food Processors
- Seafood Processors
- Oil Reclaimers and Refineries
- Edible Oil Manufacturers
- Military Installations
- Utilities
- Municipalities
- Citrus Processors
- Cutting Oil and Machine Coolant Dischargers
- Fruit Juice Processors

These are just a few of the applications for MUNOX. Here is how MUNOX can benefit your operation:

Reduction of Excessive Surcharges

Increased environmental restrictions set in motion by the Federal Pollution Control Act amendments of 1972 have pushed the current wastewater treatment plant technology to the upper limits of its capabilities. Hence, local, state and national environmental protection agencies are imposing severe end-of-pipe surcharges to industries in violation of their pretreatment standard permits. Industrial users are finding that a program of routine application of MUNOX enhances their system efficiency, resulting in low BOD and TSS levels, and lower surcharge bills.

Elimination or Delay in Necessity & Cost for New or Expanded Treatment Plant

Wastewater treatment facilities are getting heavier loads and are receiving greater volumes of difficult to degrade and sometimes toxic industrial organic wastes.

MUNOX offers a cost effective alternative to improving existing facilities, and can postpone or even prevent the need to expand or rebuild treatment facilities to accommodate increasing governmental pressures.

Reduction of Overall Cost of Treatment Plant Operation

Improved efficiency of operation means improved cost of operation. No matter how efficiently the treatment system may appear to be functioning, MUNOX is designed to complement even the best of systems. Measurable improvements will show up where it really counts — on the bottom line.

Meeting State and Federal Government Clean-Up Regulations

MUNOX has been field-proven extremely effective in remediation operations where government regulations require that contaminated soils, sludges and groundwater areas be returned to acceptable background levels. MUNOX product application speeds up clean-up time and saves man hours. MUNOX has an exceptional ability to degrade oils and petroleum hydrocarbon products.

MUNOX is an alternative technology for disposal of hazardous organics that are generated during laboratory or industrial activities and are currently being barreled for shipment to incinerator or hazardous waste landfill sites.

MUNOX Is a Proven Performer

- **MUNOX Targets Tough Organics** — The strains of bacteria present in MUNOX are among nature's most powerful and useful degraders. Microlife scientists have selected these strains for their exceptional abilities to oxidize a wide range of stubborn organics and priority pollutants.
- **Reduces BOD and TSS*** — The exceptional point-of-use viability of MUNOX assures the addition of billions of bacteria at the peak of their activity cycle, and with very versatile and sophisticated appetites. They provide enhanced removal efficiency of common wastewater organics. This increased efficiency not only allows higher organic loading, but also reduces effluent discharge of BOD and TSS.
- **Degrades Fats, Oils and Greases** — The excellent fat and oil oxidizing capabilities of MUNOX reduce operational difficulties due to build-up. The sludge-settling and dewatering characteristics will be improved, and effluent discharge levels will be reduced. MUNOX has also demonstrated effectiveness in reducing fat and protein accumulation in lift stations and grease traps.
- **Reduces Toxicity** — Many regulatory agencies are adapting toxicity tests of wastewater discharges using fish and other aquatic life forms as the test animals. MUNOX degrades many toxic organics commonly found in industrial effluent streams, thereby reducing the impact on the aquatic species used in these toxicity tests.
- **Shock Recovery** — A program of regularly scheduled treatments with MUNOX will establish high numbers of hardy and versatile bacteria which will diminish the effects of shock upsets, as well as provide quick recovery to acceptable operation parameters.
- **Odor Control** — MUNOX bacteria will out-compete and replace common odor producing microbes, thereby reducing or eliminating overall odor production.
- **Grows in up to 5% Saline Solution** — This will allow for applications in brackish water, coastal marine industries and seafood industries including brined food production effluent and seagoing vessel holding tank effluent treatment.

Where can MUNOX Be Effective?

Here are just a few of the specific compounds where MUNOX's exceptional degradation capabilities have demonstrated proven success.

2-Chlorotoluene
3-Chlorotoluene
3,4-Dichlorotoluene
2,6-Dichlorotoluene
Cresols
Benzoate
4-Chlorobenzoate
2,4-Chlorobenzoate
Methanol
Methylene chloride
Ethyl acetate
Cyclohexanone
Toluene
Ethylbenzene
1,2-Dichloroethane
2,4-Dichlorophenoxyacetic acid
2,4,5-Trichlorophenoxyacetic acid
m,o,p-Xylene
Butyl acetate
Phenol
Camphor
Naphthalene
Tetrachloroethylene
Hexane
Heptane
Octane
Nonane
Diesel Fuel
Waste oil
Bunker "C" oil
d-limonene
linalool
geraniol
citronellol

*BOD: Biological Oxidation Demand
TSS: Total Suspended Solids

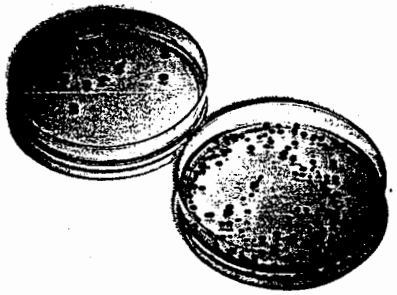
OSPREY Biotechnics

8530 S Tamiami Drive | Post Office Box 758
Sarasota, FL 34243 | Osprey, FL 34254

PRODUCT BULLETIN

MUNOX® 10X Multiplier™

The natural, fast and award-winning method for safe biotreatment of petroleum hydrocarbons and other organics in soil or groundwater and for the treatment of recalcitrant organic chemicals in waste water systems.



MUNOX 10X Multiplier

For safe, fast and economical bioremediation of petroleum hydrocarbons and other organics in contaminated soil or groundwater. Naturally.

MUNOX 10X Multiplier gives today's pollution-cleanup engineers new options. With one unit, clean a site many times faster. Or clean it for 1/10th the cost.

Now You Can grow Your Own, Under Osprey Provided Laboratory Conditions

Some "do it yourselfers" try to grow their own bacteria. Unless grown under carefully controlled microbiological conditions, these home-grown varieties contain thousands of different species competing for space and nutrients, and the prevailing survivors are typically NOT the type that degrades petroleum hydrocarbons and stubborn organics.

Osprey's "Lab-in-a-Bag" ™ technology provides the necessary laboratory conditions inside the special plastic pouch. Using aseptic packaging techniques, ONLY the MUNOX Hungry Bacteria are introduced in the bag, along with a special nutrient/growth factor formulation designed by our scientists. Final Quality Control checks assure that *NO* unwanted bacteria are included. So what multiplies in the bag is MUNOX! ONLY.

How Do You Use MUNOX 10X Multiplier For Soil Bioremediation

When you receive Osprey Biotechnics innovative "Lab-in-a-Bag", it is easy to get MUNOX 10X Multiplier into your soil and doing its job. The water-soluble bacteria are contained in a special plastic pouch, along with laboratory formulated nutrients.

Just unscrew the lid, add ordinary tap water at room temperature. There's no measuring or mixing. The water activates the bacteria and in 24 hours, by following the simple directions, you have multiplied the huge numbers of viable bacteria normally found in MUNOX by 10. All you need to do is spray the solution on your soil. Then you can depend that these Hungry bacteria are immediately at work, consuming and digesting petroleum hydrocarbon and other organics. MUNOX 10X Multiplier quickly and safely cleans soil and groundwater polluted with petroleum hydrocarbons and other organics. Simply and dependably. Definitely environmentally friendly. And very economically.

MUNOX MULTIPLIER 10X

Now Large Volume Wastewater Lagoons Can Be Economically Treated With MUNOX.

Our experience tells us that to optimize conditions in a lagoon requires a seeding of 10^9 organisms per ml of water. The problem has been that until now this has been economically impractical in a large lagoon.
Using MUNOX, these optimum conditions now become financially viable. You can seed at these levels for less than 6/10 of a cent per gallon. The standard MUNOX daily automatic "Bug-in-a Bag"® inoculant system will, at a nominal cost keep the bacteria population at the desired levels, dramatically reducing upsets.

How to use MUNOX As A Waste water Lagoon Inoculant / Seed.

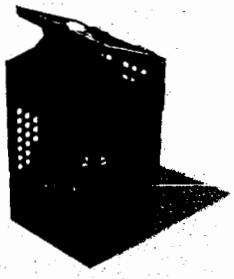
Contact Osprey's Technical Staff. They will calculate the amount of MUNOX required to reach a MUNOX population of 10^9 organisms per ml of waste water in the lagoon. Fill the proper MULTIPLIER "Lab-in-a-Bag" with tap water, wait 24 hours and empty into your lagoon. It's simple, sure and lab tested to insure a specific high population of MUNOX "Hungry Bacteria"® at the point of use.

How is MUNOX Produced?

These safe strains of natural bacteria are isolated from the soil. The bacteria are identified genetically and evaluated for their degradation ability on different substrates. The selected bacteria are grown in huge closed stainless steel vats and are harvested at an optimum point on the growth curve. It's not unlike farming. Then, using patented techniques, the bacteria are placed in suspended animation by freeze drying. Dormant, but still alive and hungry, the MUNOX bacteria are shipped to you ready to be reactivated and go to work.

Osprey Biotechnics. Experience And Stability.

The people at Osprey Biotechnics are scientists, microbiologists and trained laboratory technicians with more than ten years experience in producing the highest quality, purest, most active and effective bacteria of this type.



Knowledge, experience, sophisticated laboratory techniques, careful quality control and modern packaging distinguish Osprey Biotechnics. MUNOX guarantees that you get only the natural petroleum-eating bacteria which are safe, fully active and completely effective.

Our only business is microbiology. We're the developer and exclusive world-wide distributor of the MUNOX family of natural, reliable and effective bacteria, "*Friendly Bacteria*" for today's complex environmental needs. Solutions for problem organics in commerce and industry.

Call toll-free for detailed product specifications and laboratory test reports. 1-800-553-7785

OSPREY Biotechnics

Osprey Biotechnics
2530 B Trailmate Drive
Sarasota, Florida 34243
Phone: 813/755-7770
Fax: 813/755-0626

FIGURES

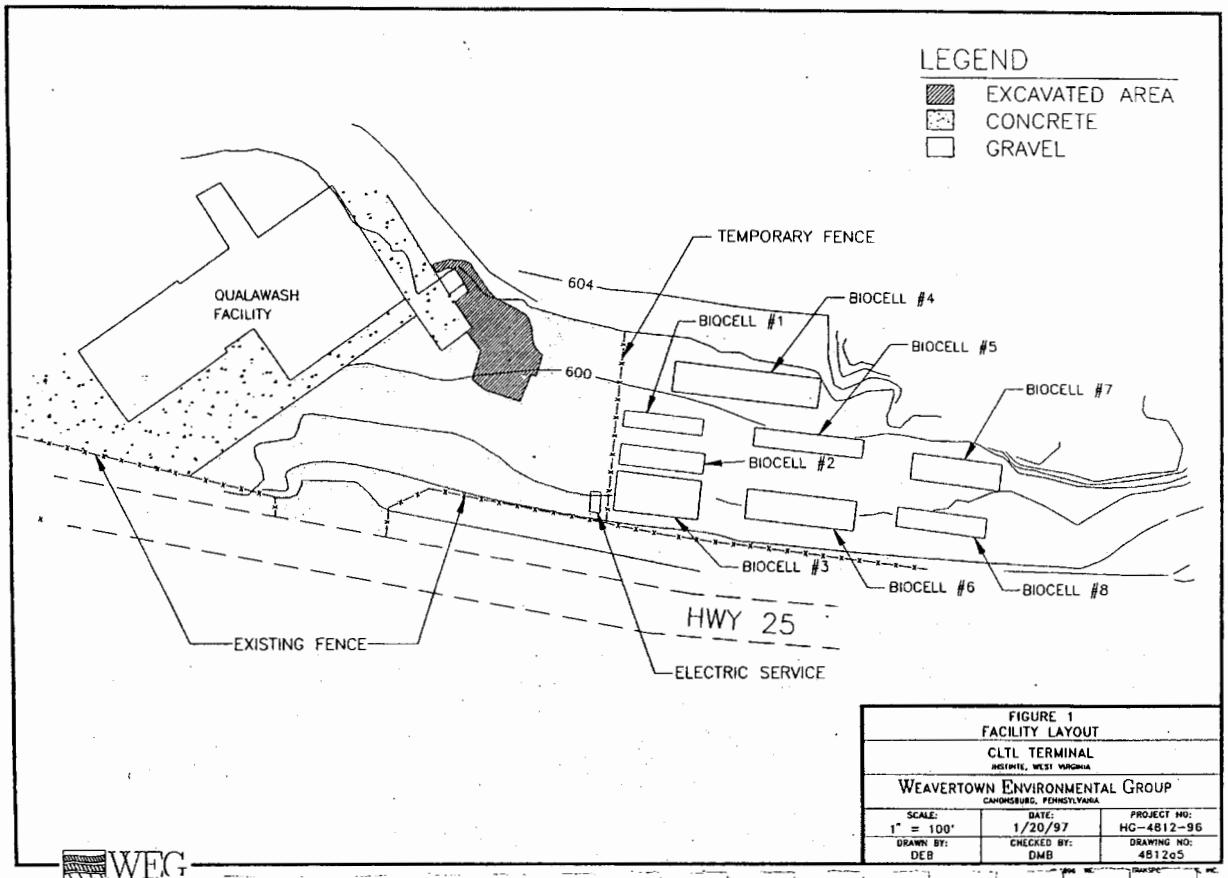
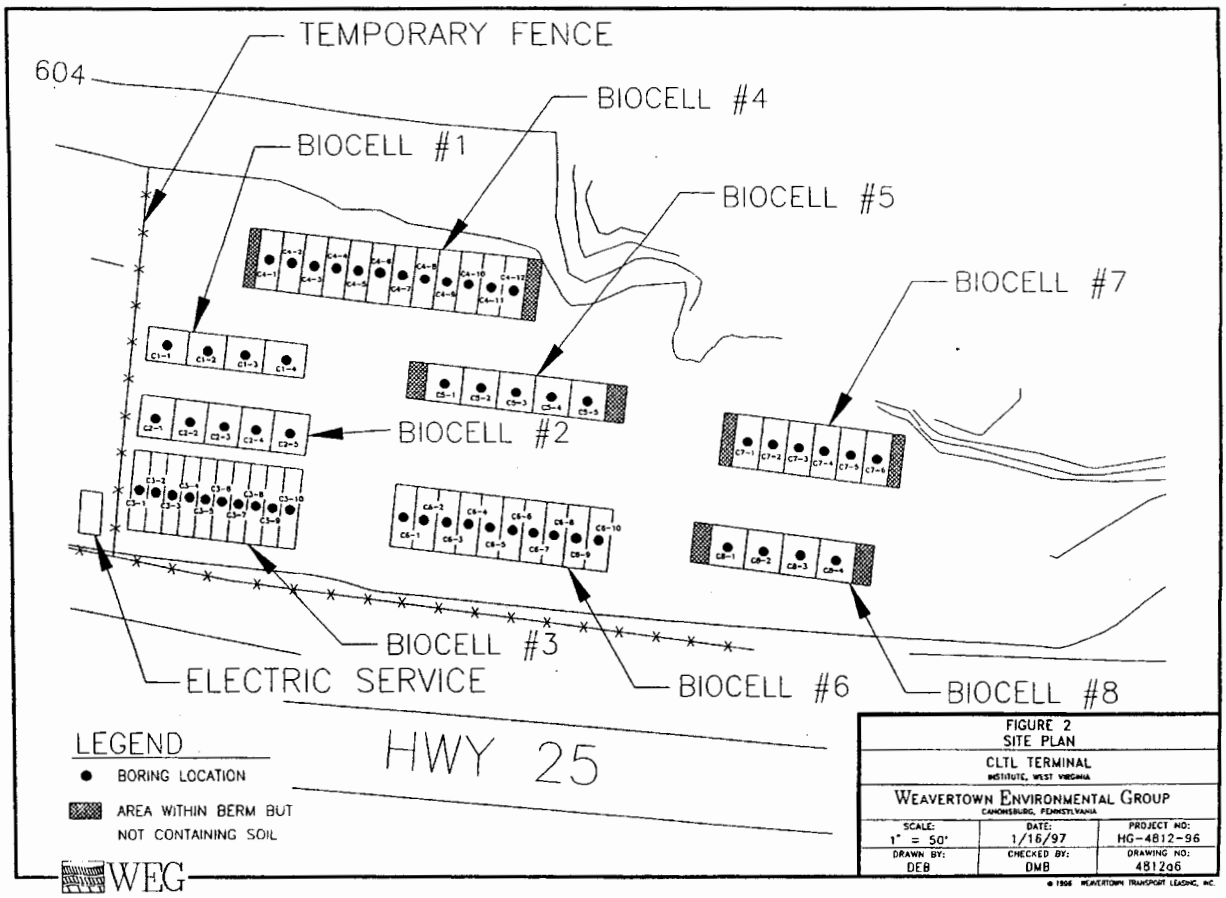


FIGURE 1 FACILITY LAYOUT		
CLTL TERMINAL INSPIRTE, WEST VIRGINIA		
WEAVERTOWN ENVIRONMENTAL GROUP CANONSBURG, PENNSYLVANIA		
SCALE: 1" = 100'	DATE: 1/20/97	PROJECT NO: HG-4812-96
DRAWN BY: DEB	CHECKED BY: DMB	DRAWING NO: 4812a5

WEG


TEMPORARY FENCE
604
BIOCELL #4
BIOCELL #1
BIOCELL #5
BIOCELL #7
BIOCELL #2
BIOCELL #3
ELECTRIC SERVICE
BIOCELL #6
BIOCELL #8
HWY 25
LEGEND
BORING LOCATION
AREA WITHIN BERM BUT NOT CONTAINING SOIL
WEG
FIGURE 2
SITE PLAN
CLTL TERMINAL
INSTITUTE, WEST VIRGINIA
WEAVERTOWN ENVIRONMENTAL GROUP
CANONSBURG, PENNSYLVANIA
SCALE: 1" = 50'
DATE: 1/16/97
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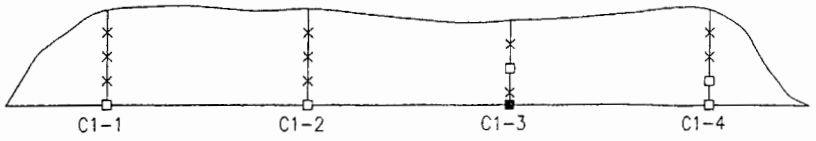
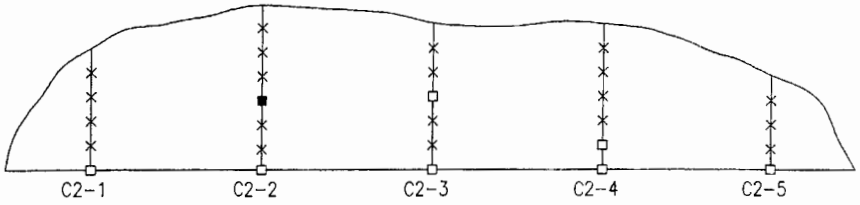


CROSS SECTION BIOCELL 1
LOOKING NORTH



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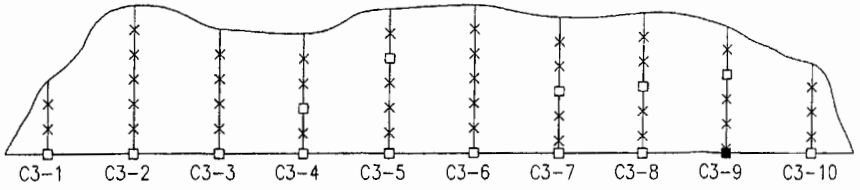
LOOKING NORTH



CROSS SECTION BIOCELL 3
LOOKING NORTH

BIOCELL 1	
BORING NO.	DEPTH
C1-1	48"
C1-2	48"
C1-3	42"
C1-4	48"

BIOCELL 2	
BORING NO.	DEPTH
C2-1	60"
C2-2	82"
C2-3	72"
C2-4	72"
C2-5	46"

BIOCELL 3	
BORING NO.	DEPTH
C3-1	36"
C3-2	72"
C3-3	60"
C3-4	58"
C3-5	70"
C3-6	72"
C3-7	66"
C3-8	68"
C3-9	62"
C3-10	44"

LEGEND

× SAMPLES NOT ANALYZED

□ SAMPLES ANALYZED AND ALL CONCENTRATIONS OF VOCs AND SVOCs ARE BELOW CORRESPONDING LDRs.

■ SAMPLES ANALYZED AND ONE OR MORE VOCs OR SVOCs ARE ABOVE CORRESPONDING LDRs.

FIGURE 3
BIOCELLS 1, 2, AND 3

CLTL TERMINAL
INSTITUTE WEST VIRGINIA

WEG ENGINEERING
PITTSBURGH, PENNSYLVANIA

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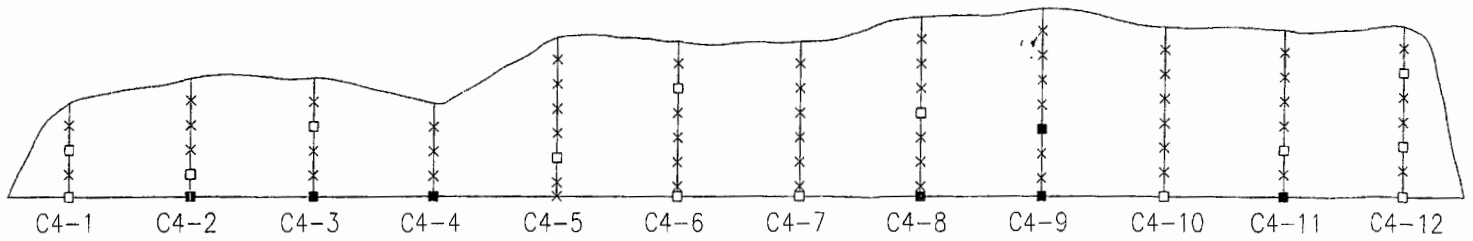
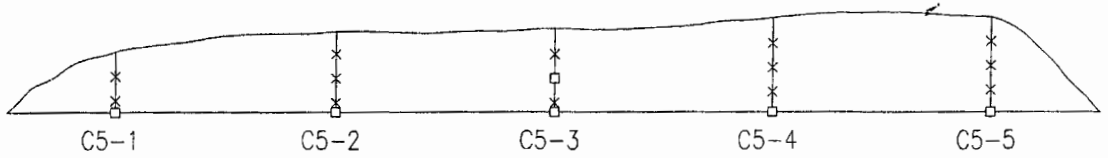
WEG engineering
Weavertown Environmental Group



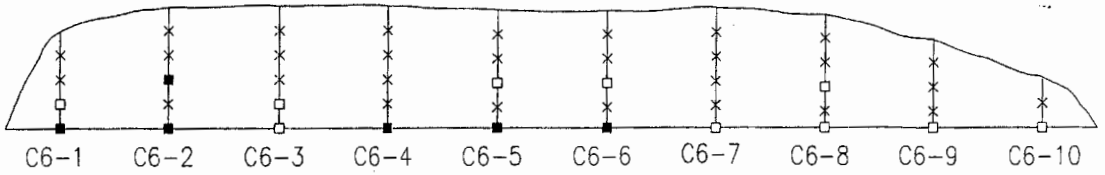
CROSS SECTION BIOCELL 4

LOOKING NORTH



CROSS SECTION BIOCELL 5

LOOKING NORTH



CROSS SECTION BIOCELL 6

LOOKING NORTH

BIOCELL 4	
BORING NO.	DEPTH
C4-1	46"
C4-2	58"
C4-3	58"
C4-4	45"
C4-5	78"
C4-6	76"
C4-7	76"
C4-8	88"
C4-9	92"
C4-10	83"
C4-11	82"
C4-12	84"

BIOCELL 5	
BORING NO.	DEPTH
C5-1	30"
C5-2	40"
C5-3	41"
C5-4	46"
C5-5	47"

BIOCELL 6	
BORING NO.	DEPTH
C6-1	48"
C6-2	60"
C6-3	60"
C6-4	60"
C6-5	58"
C6-6	58"
C6-7	59"
C6-8	56"
C6-9	44"
C6-10	24"

LEGEND

× SAMPLES NOT ANALYZED

□ SAMPLES ANALYZED AND ALL CONCENTRATIONS OF VOCs AND SVOCs ARE BELOW CORRESPONDING LDRs.

■ SAMPLES ANALYZED AND ONE OR MORE VOCs OR SVOCs ARE ABOVE CORRESPONDING LDRs.

FIGURE 4
BIOCELLS 4, 5, & 6

CLTL TERMINAL
INSTITUTE, WEST VIRGINIA

WEG ENGINEERING
PITTSBURGH, PENNSYLVANIA

SCALE:	DATE:	PROJECT NUMBER
H: 1"=10', V: 1"=5'	3/24/97	HG-4812-95
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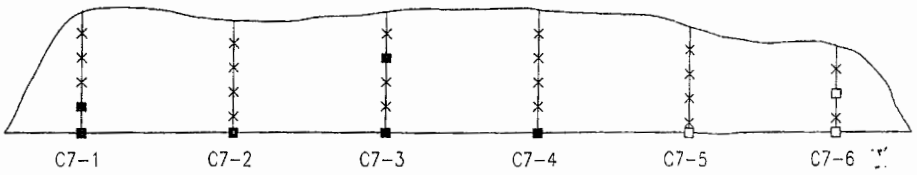
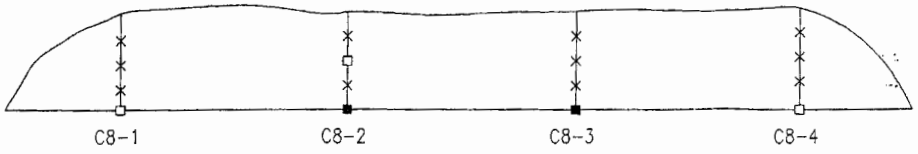
WEG engineering
Weston Environmental Group



CROSS SECTION BIOCELL 7
LOOKING NORTH

BIOCELL 7	
BORING NO.	DEPTH
C7-1	60"
C7-2	55"
C7-3	60"
C7-4	60"
C7-5	52"
C7-6	42"



CROSS SECTION BIOCELL 8
LOOKING NORTH

BIOCELL 8	
BORING NO.	DEPTH
C8-1	46"
C8-2	48"
C8-3	48"
C8-4	50"

LEGEND

- × SAMPLES NOT ANALYZED
- ⊡ SAMPLES ANALYZED AND ALL CONCENTRATIONS OF VOCs AND SVOCs ARE BELOW CORRESPONDING LDRs.
- ■ SAMPLES ANALYZED AND ONE OR MORE VOCs OR SVOCs ARE ABOVE CORRESPONDING LDRs.

FIGURE 5
BIOCELLS 7 AND 8

CLTL TERMINAL
INSTITUTE, WEST VIRGINIA

WEG ENGINEERING
PITTSBURGH, PENNSYLVANIA

SCALE:	DATE:	PROJECT NUMBER:
H: 1"=10', V: 1"=5'	3/25/97	HG-4812-95
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